

SEQUENCE LISTING

<110> Bayerische Julius-Maximilians-Universität Würzburg
<120> Mutein of a bone morphogenetic protein and use thereof
<130> S 10019 PCT
<160> 33
<170> PatentIn version 3.1
<210> 1
<211> 114
<212> PRT
<213> Homo sapiens
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<222> (1) .. (114)
<223> BMP-2

<400> 1

Gln Ala Lys His Lys Gln Arg Lys Arg Leu Lys Ser Ser Cys Lys Arg
1 5 10 15

His Pro Leu Tyr Val Asp Phe Ser Asp Val Gly Trp Asn Asp Trp Ile
20 25 30

Val Ala Pro Pro Gly Tyr His Ala Phe Tyr Cys His Gly Glu Cys Pro
35 40 45

Phe Pro Leu Ala Asp His Leu Asn Ser Thr Asn His Ala Ile Val Gln
50 55 60

Thr Leu Val Asn Ser Val Asn Ser Lys Ile Pro Lys Ala Cys Cys Val
65 70 75 80

Pro Thr Glu Leu Ser Ala Ile Ser Met Leu Tyr Leu Asp Glu Asn Glu
85 90 95

Lys Val Val Leu Lys Asn Tyr Gln Asp Met Val Val Glu Gly Cys Gly
100 105 110

Cys Arg

<210> 2
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 ttttactgcc acggagaatg cccttttcct ctggctgac atctgaactc cactaatcat 180
 gccattgttc agacgttggg caactctgtt aactctaaga ttcctaaggc atgctgtgtc 240
 ccgacagaac tcagtgttat ctgatgctg taccttgacg agaatgaaaa gggtgtatta 300
 aagaactatc aggacatggg tgtggagggt tgtgggtgtc gctag 345

<210> 3
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<220>
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 <223> BMP-4

<400> 3

Ser Pro Lys His His Ser Gln Arg Ala Arg Lys Lys Asn Lys Asn Cys
 1 5 10 15

Arg Arg His Ser Leu Tyr Val Asp Phe Ser Asp Val Gly Trp Asn Asp
 20 25 30

Trp Ile Val Ala Pro Pro Gly Tyr Gln Ala Phe Tyr Cys His Gly Asp
 35 40 45

Cys Pro Phe Pro Leu Ala Asp His Leu Asn Ser Thr Asn His Ala Ile
 50 55 60

Val Gln Thr Leu Val Asn Ser Val Asn Ser Ser Ile Pro Lys Ala Cys
 65 70 75 80

Cys Val Pro Thr Glu Leu Ser Ala Ile Ser Met Leu Tyr Leu Asp Glu
 85 90 95

Tyr Asp Lys Val Val Leu Lys Asn Tyr Gln Glu Met Val Val Glu Gly
 100 105 110

Cys Gly Cys Arg
 115

<210> 4
<211> 351
<212> DNA
<213> Homo sapiens

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<400> 4
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caggccttct actgccatgg ggactgcccc ttccactgg ctgaccacct caactcaacc 180
aaccatgcca ttgtgcagac cctgggtcaat tctgtcaatt ccagtatccc caaagcctgt 240
tgtgtgcccc ctgaactgag tgccatctcc atgctgtacc tggatgagta tgataagggtg 300
gtactgaaaa attatcagga gatggtagta gagggatgtg ggtgccgctg a 351

<210> 5
<211> 132
<212> PRT
<213> Homo sapiens

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<223> BMP-5

<400> 5

Asn Gln Asn Arg Asn Lys Ser Ser Ser His Gln Asp Ser Ser Arg Met
1 5 10 15

Ser Ser Val Gly Asp Tyr Asn Thr Ser Glu Gln Lys Gln Ala Cys Lys
20 25 30

Lys His Glu Leu Tyr Val Ser Phe Arg Asp Leu Gly Trp Gln Asp Trp
35 40 45

Ile Ile Ala Pro Glu Gly Tyr Ala Ala Phe Tyr Cys Asp Gly Glu Cys
50 55 60

Ser Phe Pro Leu Asn Ala His Met Asn Ala Thr Asn His Ala Ile Val
65 70 75 80

Gln Thr Leu Val His Leu Met Phe Pro Asp His Val Pro Lys Pro Cys
85 90 95

Cys Ala Pro Thr Lys Leu Asn Ala Ile Ser Val Leu Tyr Phe Asp Asp
 100 105 110

Ser Ser Asn Val Ile Leu Lys Lys Tyr Arg Asn Met Val Val Arg Ser
 115 120 125

Cys Gly Cys His
 130

<210> 6
 <211> 399
 <212> DNA
 <213> Homo sapiens

<220>
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 <222> (1)..(399)
 <223> BMP-5

<400> 6
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 cgggatctgg gatggcagga ctggattata gcaccagaag gatacgctgc atttttattgt 180
 gatggagaat gttctttttcc acttaacgcc catatgaatg ccaccaacca cgctatagtt 240
 cagactctgg ttcattctgat gtttcctgac caggtaccaa agccttggtg tgctccaacc 300
 aaattaaatg ccatctctgt tctgtacttt gatgacagct ccaatgtcat tttgaaaaaa 360
 tatagaaata tggtagtacg ctcatgtggc tgccactaa 399

<210> 7
 <211> 132
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 <213> Homo sapiens

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 <222> (1)..(132)
 <223> BMP-6

<400> 7

Gln Gln Ser Arg Asn Arg Ser Thr Gln Ser Gln Asp Val Ala Arg Val
 1 5 10 15

Ser Ser Ala Ser Asp Tyr Asn Ser Ser Glu Leu Lys Thr Ala Cys Arg
 20 25 30

Lys His Glu Leu Tyr Val Ser Phe Gln Asp Leu Gly Trp Gln Asp Trp
 35 40 45

Ile Ile Ala Pro Lys Gly Tyr Ala Ala Asn Tyr Cys Asp Gly Glu Cys
 50 55 60

Ser Phe Pro Leu Asn Ala His Met Asn Ala Thr Asn His Ala Ile Val
 65 70 75 80

Gln Thr Leu Val His Leu Met Asn Pro Glu Tyr Val Pro Lys Pro Cys
 85 90 95

Cys Ala Pro Thr Lys Leu Asn Ala Ile Ser Val Leu Tyr Phe Asp Asp
 100 105 110

Asn Ser Asn Val Ile Leu Lys Lys Tyr Arg Asn Met Val Val Arg Ala
 115 120 125

Cys Gly Cys His
 130

<210> 8
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<400> 8
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 caagacctgg gatggcagga ctggatcatt gcaccaagg gctatgctgc caattactgt 180
 gatggagaat gtccttccc actcaacgca cacatgaatg caaccaacca cgcgattgtg 240
 cagaccttgg ttcaccttat gaaccccgag tatgtcccca aaccgtgctg tgcgccaact 300
 aagctaaatg ccatctcggg tctttacttt gatgacaact ccaatgtcat tctgaaaaaa 360
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<210> 9
 <211> 139
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<220>
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 <222> (1)..(139)
 <223> BMP-7

<400> 9

Ser Thr Gly Ser Lys Gln Arg Ser Gln Asn Arg Ser Lys Thr Pro Lys
 1 5 10 15

Asn Gln Glu Ala Leu Arg Met Ala Asn Val Ala Glu Asn Ser Ser Ser
 20 25 30

Asp Gln Arg Gln Ala Cys Lys Lys His Glu Leu Tyr Val Ser Phe Arg
 35 40 45

Asp Leu Gly Trp Gln Asp Trp Ile Ile Ala Pro Glu Gly Tyr Ala Ala
 50 55 60

Tyr Tyr Cys Glu Gly Glu Cys Ala Phe Pro Leu Asn Ser Tyr Met Asn
 65 70 75 80

Ala Thr Asn His Ala Ile Val Gln Thr Leu Val His Phe Ile Asn Pro
 85 90 95

Glu Thr Val Pro Lys Pro Cys Cys Ala Pro Thr Gln Leu Asn Ala Ile
 100 105 110

Ser Val Leu Tyr Phe Asp Asp Ser Ser Asn Val Ile Leu Lys Lys Tyr
 115 120 125

Arg Asn Met Val Val Arg Ala Cys Gly Cys His
 130 135

<210> 10
 <211> 420
 <212> DNA
 <213> Homo sapiens

<220>
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 <222> (1)..(420)
 <223> BMP-7

<400> 10
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 cacgagctgt atgtcagctt ccgagacctg ggctggcagg actggatcat cgcgcctgaa 180
 ggctacgccg cctactactg tgaggggggag tgtgccttcc ctctgaactc ctacatgaac 240
 gccaccaacc acgccatcgt gcagacgctg gtccacttca tcaaccggga aacggtgccc 300
 aagccctgct gtgcgcccac gcagctcaat gccatctccg tcctctactt cgatgacagc 360
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<210> 11
<211> 139
<212> PRT
<213> Homo sapiens

<220>
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<222> (1)..(139)
<223> BMP-8

<400> 11

Ala Val Arg Pro Leu Arg Arg Arg Gln Pro Lys Lys Ser Asn Glu Leu
1 5 10 15

Pro Gln Ala Asn Arg Leu Pro Gly Ile Phe Asp Asp Val His Gly Ser
20 25 30

His Gly Arg Gln Val Cys Arg Arg His Glu Leu Tyr Val Ser Phe Gln
35 40 45

Asp Leu Gly Trp Leu Asp Trp Val Ile Ala Pro Gln Gly Tyr Ser Ala
50 55 60

Tyr Tyr Cys Glu Gly Glu Cys Ser Phe Pro Leu Asp Ser Cys Met Asn
65 70 75 80

Ala Thr Asn His Ala Ile Leu Gln Ser Leu Val His Leu Met Lys Pro
85 90 95

Asn Ala Val Pro Lys Ala Cys Cys Ala Pro Thr Lys Leu Ser Ala Thr
100 105 110

Ser Val Leu Tyr Tyr Asp Ser Ser Asn Asn Val Ile Leu Arg Lys His
115 120 125

Arg Asn Met Val Val Lys Ala Cys Gly Cys His
130 135

<210> 12
<211> 420
<212> DNA
<213> Homo sapiens

<220>
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<222> (1)..(420)
<223> BMP-8

<400> 12

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cgactcccag ggatctttga tgacgtccac ggctcccacg gccggcaggt ctgccgtcgg      120
cacgagctct acgtcagctt ccaggacctc ggctggctgg actgggtcat cgctcccca      180
ggctactcgg cctattactg tgagggggag tgctccttcc cactggactc ctgcatgaat      240
gccaccaacc acgccatcct gcagtccttg gtgcacctga tgaagccaaa cgcagtcccc      300
aaggcgtgct gtgcacccac caagctgagc gccacctctg tgctctacta tgacagcagc      360
aacaacgtca tcctgcgcaa gcaccgcaac atggtgggtca aggcctgcgg ctgccactga      420

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<210> 13
<211> 120
<212> PRT
<213> Homo sapiens

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<220>
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<223> GDF-5

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<400> 13

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Ala Pro Leu Ala Thr Arg Gln Gly Lys Arg Pro Ser Lys Asn Leu Lys
1              5              10              15

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Ala Arg Cys Ser Arg Lys Ala Leu His Val Asn Phe Lys Asp Met Gly
20              25              30

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```

Trp Asp Asp Trp Ile Ile Ala Pro Leu Glu Tyr Glu Ala Phe His Cys
35              40              45

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```

Glu Gly Leu Cys Glu Phe Pro Leu Arg Ser His Leu Glu Pro Thr Asn
50              55              60

```

```

His Ala Val Ile Gln Thr Leu Met Asn Ser Met Asp Pro Glu Ser Thr
65              70              75              80

```

```

Pro Pro Thr Cys Cys Val Pro Thr Arg Leu Ser Pro Ile Ser Ile Leu
85              90              95

```

```

Phe Ile Asp Ser Ala Asn Asn Val Val Tyr Lys Gln Tyr Glu Asp Met
100              105              110

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```

Val Val Glu Ser Cys Gly Cys Arg
115              120

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<210> 14
<211> 363
<212> DNA

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<213> Homo sapiens

<220>

<221> misc_feature

<222> (1)..(363)

<223> GDF-5

<400> 14

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cggaaggcac tgcattgtcaa cttcaaggac atgggctggg acgactggat catcgacccc      120
cttgagtacg aggctttcca ctgcgagggg ctgtgcgagt tcccattgcg ctcccacctg      180
gagcccacga atcatgcagt catccagacc ctgatgaact ccatggaccc cgagtccaca      240
ccacccacct gctgtgtgcc cacgcggctg agtcccatca gcacccctct cattgactct      300
gccacaacg tggtgtataa gcagtatgag gacatggctg tggagtcgtg tggtctgcagg      360
tag                                                                    363

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<210> 15

<211> 120

<212> PRT

<213> Mus musculus

<220>

<221> MISC_FEATURE

<222> (1)..(120)

<223> GDF-6

<400> 15

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Thr Ala Phe Ala Ser Arg His Gly Lys Arg His Gly Lys Lys Ser Arg
1              5              10              15

Leu Arg Cys Ser Arg Lys Pro Leu His Val Asn Phe Lys Glu Leu Gly
      20              25              30

Trp Asp Asp Trp Ile Ile Ala Pro Leu Glu Tyr Glu Ala Tyr His Cys
      35              40              45

Glu Gly Val Cys Asp Phe Pro Leu Arg Ser His Leu Glu Pro Thr Asn
      50              55              60

His Ala Ile Ile Gln Thr Leu Met Asn Ser Met Asp Pro Gly Ser Thr
65              70              75              80

Pro Pro Ser Cys Cys Val Pro Thr Lys Leu Thr Pro Ile Ser Ile Leu
      85              90              95

Tyr Ile Asp Ala Gly Asn Asn Val Val Tyr Lys Gln Tyr Glu Asp Met
      100             105             110

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Val Val Glu Ser Cys Gly Cys Arg
 115 120

<210> 16
 <211> 360
 <212> DNA
 <213> Mus musculus

<220>
 <221> misc_feature
 <222> (1)..(360)
 <223> GDF-6

<400> 16
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 ctagagtacg aggcctatca ctgcgagggc gtgtgcgact ttccgctgcg ctgcgacctt 180
 gagcccacta accatgccat cattcagacg ctgatgaact ccatggaccc gggctccacc 240
 ccgcctagct gctgcgttcc caccaaactg actcccatta gcacacctgta catcgacgcg 300
 ggcaataatg tagtctacaa gcagtatgag gacatggtgg tggagtcctg cggctgtagg 360

<210> 17
 <211> 146
 <212> PRT
 <213> Mus musculus

<220>
 <221> MISC_FEATURE
 <222> (1)..(146)
 <223> GDF-7

<400> 17

Thr Ala Leu Ala Gly Thr Arg Gly Ala Gln Gly Ser Gly Gly Gly Gly
 1 5 10 15

Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly
 20 25 30

Ala Gly Arg Gly His Gly Arg Arg Gly Arg Ser Arg Cys Ser Arg Lys
 35 40 45

Ser Leu His Val Asp Phe Lys Glu Leu Gly Trp Asp Asp Trp Ile Ile
 50 55 60

Ala Pro Leu Asp Tyr Glu Ala Tyr His Cys Glu Gly Val Cys Asp Phe
 65 70 75 80

11/21

Pro Leu Arg Ser His Leu Glu Pro Thr Asn His Ala Ile Ile Gln Thr
85 90 95

Leu Leu Asn Ser Met Ala Pro Asp Ala Ala Pro Ala Ser Cys Cys Val
100 105 110

Pro Ala Arg Leu Ser Pro Ile Ser Ile Leu Tyr Ile Asp Ala Ala Asn
115 120 125

Asn Val Val Tyr Lys Gln Tyr Glu Asp Met Val Val Glu Ala Cys Gly
130 135 140

Cys Arg
145

<210> 18
<211> 438
<212> DNA
<213> Mus musculus

<220>
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<223> GDF-7

<400> 18
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ggccgggagcc gctgcagtcg caagtccactg cacgtggact ttaaggagct gggctgggac 180
gactggatca tcgcgccatt agactacgag gcataccact gcgagggcgt ttgcgacttt 240
cctctgcgct cgcacctgga gcctaccaac cagccatca ttcagacgct gctcaactcc 300
atggcgcccc acgctgcgcc agcctcctgc tgcgtgcccg caaggctcag tcccatcagc 360
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gaggcctgcg gctgcagg 438

<210> 19
<211> 108
<212> PRT
<213> Homo sapiens

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<223> BMP-10

<400> 19

12/21

Asn Ala Lys Gly Asn Tyr Cys Lys Arg Thr Pro Leu Tyr Ile Asp Phe
 1 5 10 15

Lys Glu Ile Gly Trp Asp Ser Trp Ile Ile Ala Pro Pro Gly Tyr Glu
 20 25 30

Ala Tyr Glu Cys Arg Gly Val Cys Asn Tyr Pro Leu Ala Glu His Leu
 35 40 45

Thr Pro Thr Lys His Ala Ile Ile Gln Ala Leu Val His Leu Lys Asn
 50 55 60

Ser Gln Lys Ala Ser Lys Ala Cys Cys Val Pro Thr Lys Leu Glu Pro
 65 70 75 80

Ile Ser Ile Leu Tyr Leu Asp Lys Gly Val Val Thr Tyr Lys Phe Lys
 85 90 95

Tyr Glu Gly Met Ala Val Ser Glu Cys Gly Cys Arg
 100 105

<210> 20
 <211> 327
 <212> DNA
 <213> Homo sapiens

<220>
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 <222> (1)..(327)
 <223> BMP-10

<400> 20
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 tgggactcct ggatcatcgc tccgcctgga tacgaagcct atgaatgccg tgggtgtttgt 120
 aactaccccc tggcagagca tctcacaccc acaaagcatg caattatcca ggccttggtc 180
 cacctcaaga attcccagaa agcttccaaa gcctgctgtg tgcccacaaa gctagagccc 240
 atctccatcc tctatttaga caaaggcgtc gtcacctaca agtttaaata cgaaggcatg 300
 gccgtctccg aatgtggctg tagatag 327

<210> 21
 <211> 110
 <212> PRT
 <213> Homo sapiens

<220>
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 <222> (1)..(110)
 <223> GDF-2

<400> 21

Ser Ala Gly Ala Gly Ser His Cys Gln Lys Thr Ser Leu Arg Val Asn
 1 5 10 15

Phe Glu Asp Ile Gly Trp Asp Ser Trp Ile Ile Ala Pro Lys Glu Tyr
 20 25 30

Glu Ala Tyr Glu Cys Lys Gly Gly Cys Phe Phe Pro Leu Ala Asp Asp
 35 40 45

Val Thr Pro Thr Lys His Ala Ile Val Gln Thr Leu Val His Leu Lys
 50 55 60

Phe Pro Thr Lys Val Gly Lys Ala Cys Cys Val Pro Thr Lys Leu Ser
 65 70 75 80

Pro Ile Ser Val Leu Tyr Lys Asp Asp Met Gly Val Pro Thr Leu Lys
 85 90 95

Tyr His Tyr Glu Gly Met Ser Val Ala Glu Cys Gly Cys Arg
 100 105 110

<210> 22

<211> 333

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<222> (1)..(333)

<223> GDF-2

<400> 22

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 tgcttcttcc ccttggtga cgatgtgacg ccgacgaaac acgctatcgt gcagaccctg 180
 gtgcatctca agttccccac aaagggtgggc aaggcctgct gtgtgcccac caaactgagc 240
 cccatctccg tcctctacaa ggatgacatg ggggtgccca ccctcaagta ccattacgag 300
 ggcattgagcg tggcagagtg tgggtgcagg tag 333

<210> 23

<211> 114

<212> PRT

<213> Homo sapiens

<220>

<221> MISC_FEATURE

<222> (1)..(114)
 <223> BMP-2 mutein

<400> 23

Gln Ala Lys His Lys Gln Arg Lys Arg Leu Lys Ser Ser Cys Lys Arg
 1 5 10 15

His Pro Leu Tyr Val Asp Phe Ser Asp Val Gly Trp Asn Asp Trp Ile
 20 25 30

Val Ala Pro Pro Gly Tyr His Ala Phe Tyr Cys His Gly Glu Cys Pro
 35 40 45

Phe Pro Pro Ala Asp His Leu Asn Ser Thr Asn His Ala Ile Val Gln
 50 55 60

Thr Leu Val Asn Ser Val Asn Ser Lys Ile Pro Lys Ala Cys Cys Val
 65 70 75 80

Pro Thr Glu Leu Ser Ala Ile Ser Met Leu Tyr Leu Asp Glu Asn Glu
 85 90 95

Lys Val Val Leu Lys Asn Tyr Gln Asp Met Val Val Glu Gly Cys Gly
 100 105 110

Cys Arg

<210> 24
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 <212> PRT
 <213> Homo sapiens

<220>
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 <222> (1)..(116)
 <223> BMP-4 mutein

<400> 24

Ser Pro Lys His His Ser Gln Arg Ala Arg Lys Lys Asn Lys Asn Cys
 1 5 10 15

Arg Arg His Ser Leu Tyr Val Asp Phe Ser Asp Val Gly Trp Asn Asp
 20 25 30

Trp Ile Val Ala Pro Pro Gly Tyr Gln Ala Phe Tyr Cys His Gly Asp
 35 40 45

Cys Pro Phe Pro Pro Ala Asp His Leu Asn Ser Thr Asn His Ala Ile
50 55 60

Val Gln Thr Leu Val Asn Ser Val Asn Ser Ser Ile Pro Lys Ala Cys
65 70 75 80

Cys Val Pro Thr Glu Leu Ser Ala Ile Ser Met Leu Tyr Leu Asp Glu
85 90 95

Tyr Asp Lys Val Val Leu Lys Asn Tyr Gln Glu Met Val Val Glu Gly
100 105 110

Cys Gly Cys Arg
115

<210> 25
<211> 132
<212> PRT
<213> Homo sapiens

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<222> (1)..(132)
<223> BMP-5 mutein

<400> 25

Asn Gln Asn Arg Asn Lys Ser Ser Ser His Gln Asp Ser Ser Arg Met
1 5 10 15

Ser Ser Val Gly Asp Tyr Asn Thr Ser Glu Gln Lys Gln Ala Cys Lys
20 25 30

Lys His Glu Leu Tyr Val Ser Phe Arg Asp Leu Gly Trp Gln Asp Trp
35 40 45

Ile Ile Ala Pro Glu Gly Tyr Ala Ala Phe Tyr Cys Asp Gly Glu Cys
50 55 60

Ser Phe Pro Pro Asn Ala His Met Asn Ala Thr Asn His Ala Ile Val
65 70 75 80

Gln Thr Leu Val His Leu Met Phe Pro Asp His Val Pro Lys Pro Cys
85 90 95

Cys Ala Pro Thr Lys Leu Asn Ala Ile Ser Val Leu Tyr Phe Asp Asp
100 105 110

Ser Ser Asn Val Ile Leu Lys Lys Tyr Arg Asn Met Val Val Arg Ser
115 120 125

Cys Gly Cys His
130

<210> 26
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<223> BMP-6 mutein

<400> 26

Gln Gln Ser Arg Asn Arg Ser Thr Gln Ser Gln Asp Val Ala Arg Val
1 5 10 15

Ser Ser Ala Ser Asp Tyr Asn Ser Ser Glu Leu Lys Thr Ala Cys Arg
20 25 30

Lys His Glu Leu Tyr Val Ser Phe Gln Asp Leu Gly Trp Gln Asp Trp
35 40 45

Ile Ile Ala Pro Lys Gly Tyr Ala Ala Asn Tyr Cys Asp Gly Glu Cys
50 55 60

Ser Phe Pro Pro Asn Ala His Met Asn Ala Thr Asn His Ala Ile Val
65 70 75 80

Gln Thr Leu Val His Leu Met Asn Pro Glu Tyr Val Pro Lys Pro Cys
85 90 95

Cys Ala Pro Thr Lys Leu Asn Ala Ile Ser Val Leu Tyr Phe Asp Asp
100 105 110

Asn Ser Asn Val Ile Leu Lys Lys Tyr Arg Asn Met Val Val Arg Ala
115 120 125

Cys Gly Cys His
130

<210> 27
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<222> (1)..(139)

<223> BMP-7 mutein

<400> 27

Ser Thr Gly Ser Lys Gln Arg Ser Gln Asn Arg Ser Lys Thr Pro Lys
1 5 10 15

Asn Gln Glu Ala Leu Arg Met Ala Asn Val Ala Glu Asn Ser Ser Ser
20 25 30

Asp Gln Arg Gln Ala Cys Lys Lys His Glu Leu Tyr Val Ser Phe Arg
35 40 45

Asp Leu Gly Trp Gln Asp Trp Ile Ile Ala Pro Glu Gly Tyr Ala Ala
50 55 60

Tyr Tyr Cys Glu Gly Glu Cys Ala Phe Pro Pro Asn Ser Tyr Met Asn
65 70 75 80

Ala Thr Asn His Ala Ile Val Gln Thr Leu Val His Phe Ile Asn Pro
85 90 95

Glu Thr Val Pro Lys Pro Cys Cys Ala Pro Thr Gln Leu Asn Ala Ile
100 105 110

Ser Val Leu Tyr Phe Asp Asp Ser Ser Asn Val Ile Leu Lys Lys Tyr
115 120 125

Arg Asn Met Val Val Arg Ala Cys Gly Cys His
130 135

<210> 28

<211> 139

<212> PRT

<213> Homo sapiens

<220>

<221> MISC_FEATURE

<222> (1)..(139)

<223> BMP-8 mutein

<400> 28

Ala Val Arg Pro Leu Arg Arg Arg Gln Pro Lys Lys Ser Asn Glu Leu
1 5 10 15

Pro Gln Ala Asn Arg Leu Pro Gly Ile Phe Asp Asp Val His Gly Ser
20 25 30

His Gly Arg Gln Val Cys Arg Arg His Glu Leu Tyr Val Ser Phe Gln

35

40

45

Asp Leu Gly Trp Leu Asp Trp Val Ile Ala Pro Gln Gly Tyr Ser Ala
 50 55 60

Tyr Tyr Cys Glu Gly Glu Cys Ser Phe Pro Pro Asp Ser Cys Met Asn
 65 70 75 80

Ala Thr Asn His Ala Ile Leu Gln Ser Leu Val His Leu Met Lys Pro
 85 90 95

Asn Ala Val Pro Lys Ala Cys Cys Ala Pro Thr Lys Leu Ser Ala Thr
 100 105 110

Ser Val Leu Tyr Tyr Asp Ser Ser Asn Asn Val Ile Leu Arg Lys His
 115 120 125

Arg Asn Met Val Val Lys Ala Cys Gly Cys His
 130 135

<210> 29
 <211> 120
 <212> PRT
 <213> Homo sapiens

<220>
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 <222> (1)..(120)
 <223> GDF-5 mutein

<400> 29

Ala Pro Leu Ala Thr Arg Gln Gly Lys Arg Pro Ser Lys Asn Leu Lys
 1 5 10 15

Ala Arg Cys Ser Arg Lys Ala Leu His Val Asn Phe Lys Asp Met Gly
 20 25 30

Trp Asp Asp Trp Ile Ile Ala Pro Leu Glu Tyr Glu Ala Phe His Cys
 35 40 45

Glu Gly Leu Cys Glu Phe Pro Pro Arg Ser His Leu Glu Pro Thr Asn
 50 55 60

His Ala Val Ile Gln Thr Leu Met Asn Ser Met Asp Pro Glu Ser Thr
 65 70 75 80

Pro Pro Thr Cys Cys Val Pro Thr Arg Leu Ser Pro Ile Ser Ile Leu
 85 90 95

Phe Ile Asp Ser Ala Asn Asn Val Val Tyr Lys Gln Tyr Glu Asp Met
 100 105 110

Val Val Glu Ser Cys Gly Cys Arg
 115 120

<210> 30
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 <212> PRT
 <213> Mus musculus

<220>
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 <222> (1)..(120)
 <223> GDF-6 mutein

<400> 30

Thr Ala Phe Ala Ser Arg His Gly Lys Arg His Gly Lys Lys Ser Arg
 1 5 10 15

Leu Arg Cys Ser Arg Lys Pro Leu His Val Asn Phe Lys Glu Leu Gly
 20 25 30

Trp Asp Asp Trp Ile Ile Ala Pro Leu Glu Tyr Glu Ala Tyr His Cys
 35 40 45

Glu Gly Val Cys Asp Phe Pro Pro Arg Ser His Leu Glu Pro Thr Asn
 50 55 60

His Ala Ile Ile Gln Thr Leu Met Asn Ser Met Asp Pro Gly Ser Thr
 65 70 75 80

Pro Pro Ser Cys Cys Val Pro Thr Lys Leu Thr Pro Ile Ser Ile Leu
 85 90 95

Tyr Ile Asp Ala Gly Asn Asn Val Val Tyr Lys Gln Tyr Glu Asp Met
 100 105 110

Val Val Glu Ser Cys Gly Cys Arg
 115 120

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 <211> 146
 <212> PRT
 <213> Mus musculus

<220>
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 <222> (1)..(146)
 <223> GDF-7 mutein

<400> 31

Thr Ala Leu Ala Gly Thr Arg Gly Ala Gln Gly Ser Gly Gly Gly Gly
1 5 10 15

Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly Gly
20 25 30

Ala Gly Arg Gly His Gly Arg Arg Gly Arg Ser Arg Cys Ser Arg Lys
35 40 45

Ser Leu His Val Asp Phe Lys Glu Leu Gly Trp Asp Asp Trp Ile Ile
50 55 60

Ala Pro Leu Asp Tyr Glu Ala Tyr His Cys Glu Gly Val Cys Asp Phe
65 70 75 80

Pro Pro Arg Ser His Leu Glu Pro Thr Asn His Ala Ile Ile Gln Thr
85 90 95

Leu Leu Asn Ser Met Ala Pro Asp Ala Ala Pro Ala Ser Cys Cys Val
100 105 110

Pro Ala Arg Leu Ser Pro Ile Ser Ile Leu Tyr Ile Asp Ala Ala Asn
115 120 125

Asn Val Val Tyr Lys Gln Tyr Glu Asp Met Val Val Glu Ala Cys Gly
130 135 140

Cys Arg
145

<210> 32

<211> 108

<212> PRT

<213> Homo sapiens

<220>

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<222> (1)..(108)

<223> BMP-10 mutein

<400> 32

Asn Ala Lys Gly Asn Tyr Cys Lys Arg Thr Pro Leu Tyr Ile Asp Phe
1 5 10 15

Lys Glu Ile Gly Trp Asp Ser Trp Ile Ile Ala Pro Pro Gly Tyr Glu
20 25 30

